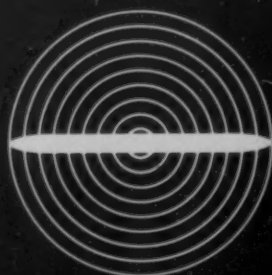
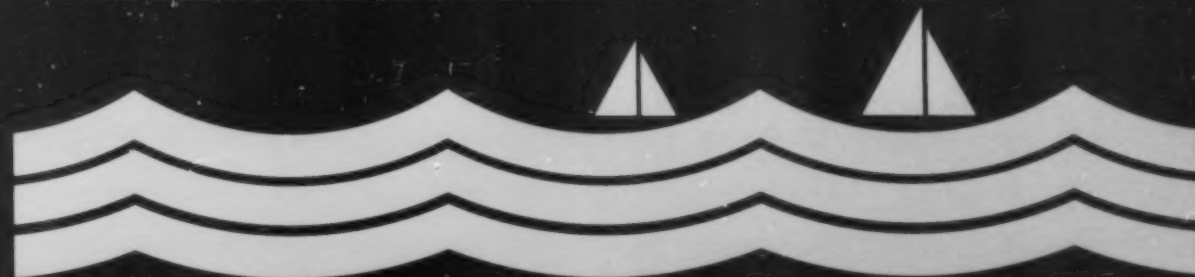
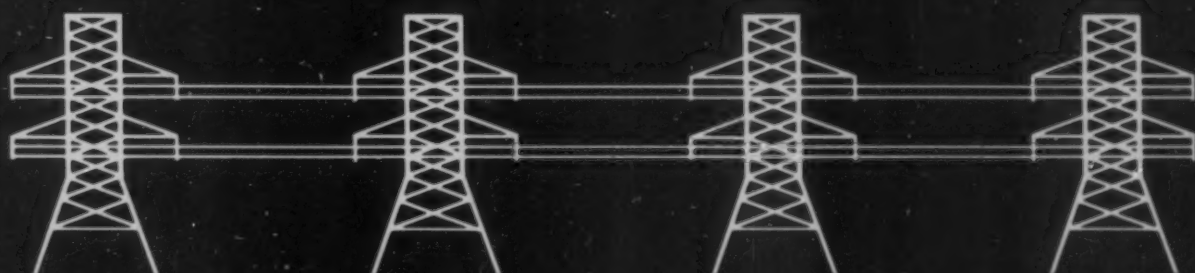


Reclamation



A Water Review Quarterly  
Vol. 67 No. 4



## Reclamation



A Water Review Quarterly  
Vol. 67 No.4

## United States Department of the Interior

James G. Watt, Secretary

## Bureau of Reclamation

Robert N. Broadbent  
Commissioner

## Cover:

The illustrations represent the most important benefits of the Bureau of Reclamation's program: hydroelectric power production, irrigated agriculture, recreation and research in fields such as alternative energy sources.

## Editor

Carol A. White

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As the Nation's principal conser-  
vation agency, **The Department of  
the Interior** has the responsibility  
for most of our nationally owned  
public lands and natural re-  
sources. This includes fostering  
the wisest use of our land and  
water resources, protecting our  
fish and wildlife, preserving the  
environmental and cultural values

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of our national parks and histori-  
cal places, and providing for the  
enjoyment of life through outdoor  
recreation. The Department  
assesses our energy and mineral  
resources and works to assure  
that their development is in the  
best interests of all our people.  
The Department also has a major  
responsibility for American Indian  
reservation communities and for  
people who live in Island Territo-  
ries under U.S. administration.

**The Bureau of Reclamation** of the  
U.S. Department of the Interior is  
responsible for the development  
and conservation of the Nation's  
water resources in the western  
United States.

The Bureau's original purpose "to  
provide for the reclamation of arid  
and semiarid lands in the West"  
today covers a wide range of  
inter-related functions. These  
include providing municipal and  
industrial water supplies; hydro-  
electric power generation; irriga-  
tion water for agriculture; water  
quality improvement; flood con-  
trol; river regulation and control;  
fish and wildlife enhancement;  
outdoor recreation; and research  
in atmospheric water manage-  
ment and alternative energy  
sources, such as wind and solar  
power. The Bureau of Reclama-  
tion is also a primary source of  
research in the design, construc-  
tion and development of materials  
used in water management struc-  
tures. Bureau programs most fre-  
quently are the result of close  
cooperation with the U.S. Con-  
gress, other Federal agencies,  
States, local governments, aca-  
demic institutions, water-user  
organizations, and other con-  
cerned groups.

# The Central Utah Experience

by Theda B. Butt

What happens when you get together several "dam ecologists" or environmentalists, a Reclamation bureaucrat or two, some media representatives, and a sprinkling of other interested persons to discuss common issues? Add a complex and sometimes controversial project like the Central Utah Project (CUP) and see what develops ... answer: the Central Utah Project Experience.



Theda B. Butt, Public Affairs Specialist, serves in Reclamation's Upper Colorado Region, headquartered in Salt Lake City, Utah. She is also the coordinator for the Central Utah Project Experience.

Photography by Tom Fridmann, Regional Photographer for the Upper Colorado Region, located in Salt Lake City, Utah.



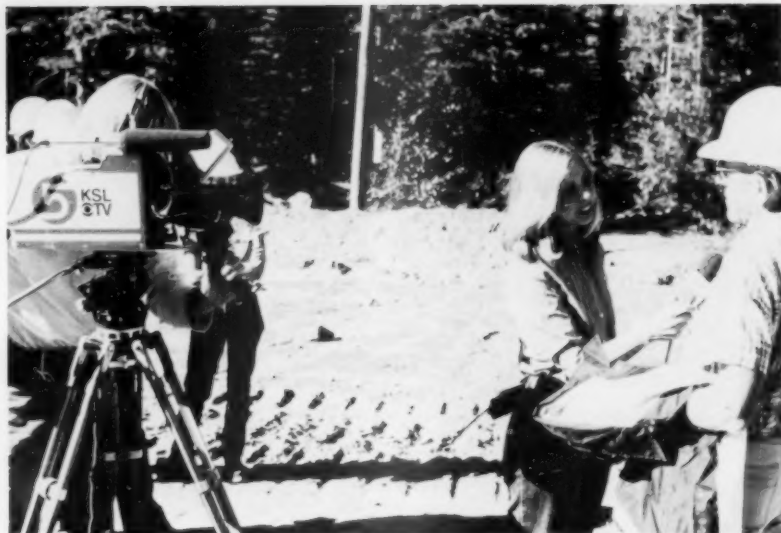
A river-rafting trip down the Green River below Flaming Gorge Dam is a welcome change of pace. From left to right: Frances Farley; Mike Barker (with back to camera); Floyd Gale; Diane Siegfried; Kathy Loveless; Gordy Lind.

After attending a Central Utah Project Experience, the *Daily Herald's* (Provo, Utah) city editor wrote the following:

"In recent years the term 'dam ecologist' has been an epithet reserved for environmentalists obstructing large public works projects.

"But of late it is a term being used for environmental specialists working for the Bureau of Reclamation, the federal government's division that specializes in dam building."

Were you to ask a dozen people on a Salt Lake City street to explain the Central Utah Project (CUP), you would receive vague fragments of news reports they have either read or heard. Even though information about the CUP's features appear often in the media, the CUP is often misunderstood because of its vastness.



Carol Mikita, Channel 5 News (Salt Lake City), interviews Sherman Ruesch during CUP Experience.



Dan Giles, Reclamation Construction Engineer, explains construction being done at the Upper Stillwater Dam site.

In an attempt to reduce the public's misconceptions of this immense project that will benefit so many, and to better inform the public about what the CUP really is, the Central Utah Project Experience was initiated by the Bureau of Reclamation in the summer of 1981 and continued during the summer of 1982.

The Experience is an opportunity for selected members of the community with diverse backgrounds to explore and evaluate for themselves the features and issues of the CUP during a 3-day, 2-night tour of the project.

Participants arrive at the Federal Building in Salt Lake City early in the morning with their overnight gear, some apprehension, and a lot of curiosity. They wonder how they can gain a better understanding of the CUP by being seat-belted for most of 3 days in a vehicle with total strangers.

In selecting participants for the Experience, Reclamation chooses individuals whose influence reaches a great number of people. Opinion leaders of communities most impacted by the CUP are invited. Both those who support and oppose the project attend, as well as representatives from television stations and newspapers.

In mapping out the travel itinerary, Upper Colorado regional CUP Experience coordinators wanted to include features of the project that demonstrated the tremendous diversity of the CUP and the lands it serves. The tour includes travel through arid lands where sparse foliage grows, forest with thick vegetation, farming communities where crop growth depends heavily on irrigation, and towns where municipal and industrial water use has improved the standard of living.



One senior-citizen participant said, "When I left Utah in 1950, farming was marginal in what now are fields lush with sprinkler systems. It used to be that there wasn't enough storage water to make more than a small second crop of alfalfa. Now the sprinklers make third crops look like first crops did years ago."

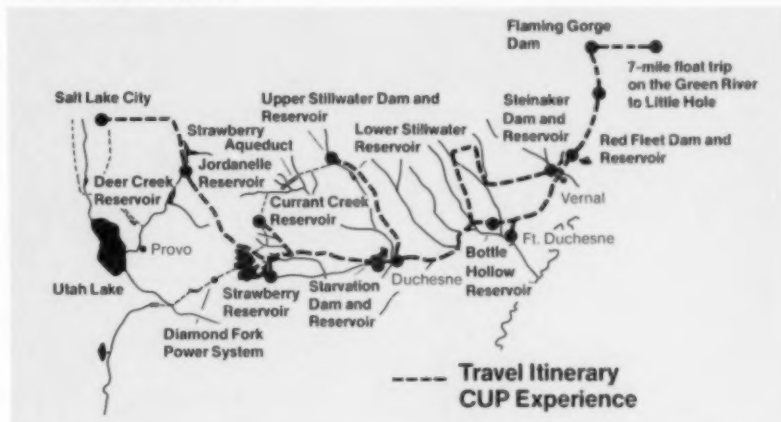
The criteria used for selection of tour sites in various stages of construction was that they be accessible and that combined, they provide a broad overview of the CUP. At each stop, a knowledgeable Reclamation employee explains how that feature fits into the master CUP plan.

The CUP is just what the name implies — a water development project that covers central Utah. The project is so vast that it is divided into six units. The best-known and most comprehensive is the Bonneville Unit. The others are Vernal, Jensen, Upalco, Uintah and Ute Indian. Vernal is the only completed unit.

The Bonneville Unit will consist of water collection and distribution systems in the Uinta and Bonneville Basins. When completed, the Bonneville Unit will include 10 new reservoirs; 2 enlarged reservoirs; 140 miles of aqueducts, tunnels and canals; 5 powerplants; 9 pumping plants and 200 miles of irrigation drains. The unit will provide about 100,000 acre-feet of municipal and industrial water; about 205,000 acre-feet of irrigation water for 29,000 acres of new farmland, and 213,000 acres of existing farmland now periodically short of water; and water releases for stream fisheries. (An acre-foot of water is 325,851 gallons, enough to cover one acre to a depth of one foot.) Large quantities of hydroelectric power will be produced by the Diamond Fork Power System. Extensive, modern recreation facilities will be provided.



Howard Pearson, with outstretched arm, gives explanation to CUP Experience participants at Soldier Creek Dam Overlook.



A typical session of the Central Utah Project Experience was held in August 1982, with the usual mix of personalities, occupations, and points of view among the eleven men and seven women.

The first day, we stopped at the proposed Jordanelle Dam site, Water Hollow Tunnel, Strawberry Tunnel Inlet and Reservoir, Soldier Creek Dam, Starvation Dam and Reservoir (all part of the Bonneville Unit) and at the Uinta Basin Construction Office. The tour also passed Steinaker Dam of the Vernal Unit and Red Fleet Dam of the Jensen Unit.

The first night we camped near the construction site of the Upper Stillwater Dam, within walking distance of Stillwater Tunnel.

An unusual situation exists at Stillwater Tunnel. Two tunnel boring machines, called "moles," are penetrating the mountain, one from the outlet portal on one side of the mountain and one from the inlet portal on the opposite side. The moles will "hole through" somewhere near the center of the mountain.

As we walked into the tunnel, we heard the rushing air of the ventilation system. And, we listened to the inspector explain some of the problems of tunnel excavation.

The CUP has seven tunnels, collectively called the Strawberry Aqueduct System. This extensive system will transport water from the Uinta Basin to the Bonneville Basin, a distance of nearly 37 miles. Stillwater Tunnel, uppermost in the system, will be the

Since all hands were needed to prepare the night's lodging and meal, a special camaraderie developed as participants joined in to meet the needs of the group. People who had been total strangers hours earlier became acquainted as they chopped carrots, quartered potatoes, tossed salads, and cried over onions.

The campfire conversation created a feeling of friendliness and interest in other participants



Diane Siegfried talks with Gordon Lind.

last completed. All tunnels are scheduled to be in operation by spring of 1987.

Following the tour of Stillwater Tunnel and the Upper Stillwater Dam site, participants and Bureau employees worked together to make fires, to start the "community stew," and to pitch tents. In good weather, many slept under the stars; but when rain threatened, all headed for the tents.

on the tour. Project opponents and proponents discovered that Reclamation employees were as interested as the environmentalists in preserving the beauty of the wilderness. They began to realize that Reclamation's aim is to build as carefully as possible and to restore the land.



Don Cole, Bonneville Construction Field Engineer, explains procedures for the rehabilitation of the Strawberry Tunnel Inlet Portal. (left to right) Mike Barker, Cheryl Riedmiller, Don Cole, Graham Wozencroft and Lee Renegar, both of Ohbayashi-Gumi.

One historian who went on the trip said, "As I gained a broader understanding of the CUP, I also learned of Reclamation's concern for the total environment, including cultural resource management."

"As a leader of a variety of environmental organizations interested in public awareness of natural resource issues," an environmental education counselor said, "I found the field trips offered excellent on-site information, knowledgeable resource personnel to respond to questions, and opportunities to meet and interact with other concerned representatives within the Utah community."

In the chilly morning air the following day, the smell of bacon frying, mixed with the promise of a cup of coffee around the campfire, aroused most campers. Those who had no air mattress or pad to shield their bones from protruding rocks and roots were glad to get up. And with each succeeding trip Reclamation "cooks" became more skilled at cooking pancakes and eggs under adverse conditions.

The second day included a visit to Bottle Hollow Resort and a stop at the Fort Duchesne Ute Tribal Headquarters where a tribal official offered insight into Indian needs and Reclamation's efforts to meet those needs.

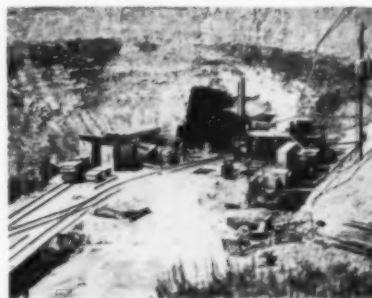
The group traveled through the Vernal and Jensen Units on the way to Flaming Gorge Dam and Powerplant. While Flaming Gorge Dam is not a part of the CUP, it is a storage unit of the Colorado River Storage Project. It provided an opportunity to see a powerplant in operation and to observe how a dam can improve downstream fisheries.

Many CUP powerplants are still in the planning process. The proposed Diamond Fork Power System will have 10 times the capacity of Flaming Gorge Powerplant.

Recreation is an important consideration on every Reclamation project. The regional staff wanted the group to experience this facet of water use. After the tour of the powerplant, the party took a 7-mile float trip down the Green River below Flaming Gorge Dam.

"I had never been on a river trip before," one retired woman said. "Even though I've been involved with water issues a long time, I didn't know what to expect, but it was a terrific experience."

An intriguing change took place as people climbed into the rafts for the float trip. Whatever individual aloofness had been retained to this point was overcome as each group became a team, struggling to stay dry, and retaliating when doused by another raft team. Personal reservations were abandoned and the



Strawberry Tunnel Inlet, Bonneville Unit, Central Utah Project.

groups became gregarious. The water, even on sunny afternoons, is cool for swimming, but some of the more adventuresome jumped in.

Following the night of camping and the river trip, showers at the Reclamation guest house in Dutch John, Utah, were welcomed. Rejuvenated, volunteers cooked the evening meal. Culinary skills within the group emerged and the food was superb. Those not talented in cooking helped with the ever-present clean-up tasks.



Cheryl Riedmiller samples the community stew.



Everyone helps in setting up the first night's lodgings. (left to right) Mike Barker, Dick Cook, Craig Fuller, Jim Woolf.

To cap off an eventful day, two Bureau of Reclamation movies were shown: "Flaming Gorge," a film about construction of the dam and "Living Waters of the Colorado," a film on the fish, wildlife and recreation aspects of the Colorado River. The participants were delighted to learn that a member of the Reclamation staff, W. L. (Bud) Rusho (affectionately called Cecil B. deRusho), had directed both films.

The *Daily Herald* wrote, "Bud Rusho, historian and photographer, could keep a hungry lion spellbound with his tales of Utah's past. He makes movies about the State's natural beauties that make you proud you are smart enough to live here."

Group discussions and one-on-one conversations were mingled with a keen sense that, though the tour would soon be ending, friendships had developed during the past 2 days which would be valued in the future.

A newspaper man commented, "It's interesting to meet both the people who want a project and do not think it will devastate the land, and those who do not want the project at all; to be able to hear both sides, and to see that they can still talk together peacefully."

Comments like these reinforced the feelings of Bureau staff that the Experience was worthwhile. The efforts required to take a group of 20 or more on such an extensive trip were rewarded. Each group was stimulating, especially our second group which contained several of those "environmentalists" who openly opposed water developments.

Following a tour in 1981, one television station did a 30-minute documentary about CUP, presenting facts on both sides of the water question, interviewing environmentalists, community



CUP participants on the Green River. From left to right: Frances Farley; Diane Siegfried; Floyd Gale; Mike Barker; Gordy Lind; Kathy Loveless; (with back to camera).

groups, and Reclamation staff. The final decision of what was "right" remained with the listener.

Every group was delightfully cooperative. Although at times on the trip we may have disagreed vigorously among ourselves, by the third day everyone felt he or she had developed valued friends.

"Can we have a reunion some time so we can get re-acquainted with our group?" one legislator asked.

A most fascinating development occurred at breakfast on the last day of the final tour for 1982. The guest house can sleep a maximum of 10, so Reclamation staff obtained rooms for themselves at the Flaming Gorge Lodge about 7 miles away. The Reclamation staffers got up early to go back to the guest house to cook breakfast.





Jason Cuch of the Ute Indian Tribe talks with participants at the Fort Duchesne Ute Indian Tribal Headquarters.

However, when they arrived, sausage and toast aromas greeted them. The fruit had been cut and was artistically arranged on the tables. The guests had decided to make breakfast for their Reclamation hosts. The unexpected was delightful every time it happened, and something nice happened on every trip.

"It is unfortunate that more community leaders, decisionmakers, and legislators do not avail themselves of this opportunity," a journalist said. "I've been writing about environmental issues about the CUP for years but I learned more on this trip than I have been able to glean previously."

Another commented, "This tour was certainly innovative. It amazes me the depth of learning that can be achieved in such a way. It's apparent a lot of thought and planning was done before we joined you."

During the final evaluation, it was apparent that the group had become a unit, interested in each other, willing to communicate and exchange ideas, and each opinion was valued. Constructive ideas for future trips were adopted wherever practical.

Certainly, the Central Utah Project Experience required time and effort on the part of both Reclamation staff and participants.



Participants enjoy their last night on the CUP Experience at Reclamation's guest house in Dutch John, Utah, near Flaming Gorge Dam.

Now, after 2 years of these informative tours, Upper Colorado regional staff is convinced the tours are one of the most beneficial ways to explain the CUP. The value of establishing a working relationship with people of differing views cannot be measured in dollars.

One newspaper, previously critical of Reclamation and the CUP, the *Daily Herald* wrote, "Bureaucrats Aren't So Bad." That writer indicated he had tried to stereotype Reclamation employees, but had failed because the staff on the trip was "so disarmingly nice."

He added, "When you sit down to discuss a problem with them, they seem to be sincere people trying to do their jobs."

Community opinion leaders now have CUP facts supplemented with knowledge from their own first-hand experience to take to their constituents, the people who will benefit from the CUP. But most of all, the numbers of people who have seen and who know what the CUP really means, is growing.



Howard Pearson and Cheryl Riedmiller overlook Soldier Creek Dam, Bonneville Unit.



End of the line for the 1982 Central Utah Experience. Participants exchange farewells at the Federal Building in Salt Lake City.

**The Central Utah Project Experience  
Guests August 1-12, 1982**

**Craig Fuller**, Historian, Administrative Assistant to the Director, Utah State Historical Society

**Frances Farley**, Utah State Senator

**Diane Siegfried**, Utah Association for Energy and Environmental Education, Logan, Utah

**Mike Barker**, Administrative Assistant, Development Services, Utah State Parks Department

**Jim Woolf**, reporter, *Salt Lake Tribune*

**Bob Marquardt**, Student, aide to Senator Frances Farley

**Reclamation Staff**

**Cheryl Riedmiller**, Director, Public Affairs Office, Washington, D. C.

**Gus Washington**, Staff Assistant, Public Affairs Office, Washington, D. C.

**Mitch Snow**, Staff Assistant, Public Affairs Office, Washington, D. C.

**Kathy Loveless**, Upper Colorado Region Public Affairs Officer

**Richard Cook**, Economist, Utah Projects Office

**Lee Swensen**, Supervisory Biologist, Duchesne Field Office

**Gordy Lind**, Supervisory Biologist, Upper Colorado Regional Office

**Tom Fridmann**, Regional Photographer, Upper Colorado Region

**Ann Hadlock**, Contract Repayment Specialist, Utah Projects Office

**Stacey Leon**, Clerk-Stenographer, Upper Colorado Region

**Theda Butt**, Public Affairs Specialist, Upper Colorado Region, Coordinator

**Oscar Olsen**, Bus driver

**Floyd Gale**, Oarsman

# *Wind Turbines: The Beginning of A New Age*

by Clark Germann

Survival in the early West depended on the availability of water. And, water was a scarce commodity in that arid land. The first settlers claimed the lands on or near the rivers and lakes where they had access to the precious water supply.

As more and more settlers arrived, however, they were forced farther and farther from the sources of water. It was then, with the advent of the windmill, that they were able to tap the water below the land's surface by pumping it up. Now it became possible even for a small ranch to use the windmill to obtain water for home use, livestock and even some irrigation.

*(Continued on page 12)*

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Clark Germann, Public Information Specialist, serves in the Lower Missouri Regional Office, headquartered in Denver, Colorado.

Photography by Jim Todd, Regional Photographer, Lower Missouri Region, Denver, Colorado.

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Wind energy from Medicine Bow now supplements power produced by conventional means.

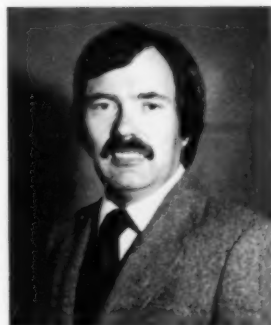
# Dateline: Medicine Bow, Wyo... Giant Wind Turbines Dedicated

by Clark Germann

September 4, 1982

*Medicine Bow, Wyoming ...* The folks from this small, southern Wyoming town had never seen anything quite like it before. For that matter, neither had anyone else.

A country band wailed a Merle Haggard number as the crowd gathered. Local kids tried their luck at hawking hot dogs and soft drinks. A small herd of antelope looked on from about a mile away — probably wondering what was disturbing their peace.



Clark Germann attended the dedication ceremony in Medicine Bow, witnessing the startup of two wind turbines.

Photography was done by Jim Todd, Regional Photographer, Lower Missouri Region.



Antelope roam at the Medicine Bow wind energy site.

A string of unlikely contrasts spiced up the event: VIP's in three-piece suits, and cowboys and miners in denim shirts and jeans; pickup trucks with hay bales in the back and tour buses; a 50-year-old ranch windmill

made by a company called "Aeromotor" and the latest gee-whiz hardware produced by companies like United Technologies (Hamilton Standard Division) and Boeing Engineering and Construction.

(Continued on page 16)



Farmer's home on the North Platte Project, Wyoming - 1911.

(Continued from page 10)

As a result, a knowledge of windmill design and the ability to keep windmills operating became essential to survival in the early West.

The use of wind actually goes back much further. Sailing ships were used by early civilizations. Buddhist monks reportedly used wind devices as "prayer wheels" to send messages to God more than 2,000 years ago. In Europe, windmills were used to pump water, grind grain and produce paper. In fact, wind was a primary source of energy before the Industrial Revolution.

Today, many people are confident the wind will help us solve our energy problems. And two giant wind turbines located on a high plain south of the town of Medicine Bow, Wyoming, are leading the way.

The larger of the two wind machines was built by the Hamilton Standard Company. It stands nearly 400 feet high and the 257-foot-diameter fiberglass blades turn at 30 revolutions per minute to produce 4 megawatts of electricity. Unlike the nearby ranch windmill, this giant machine faces away from the wind.

About a mile to the southeast stands a second wind turbine. But this one, made by Boeing (of aircraft fame), is different. It is

slightly smaller, but uses a much longer blade. The unit faces into the wind and the steel rotor churns out 2.5 megawatts of power.

Producing large amounts of electricity in near silence, the two giant wind turbines represent the far-sightedness, innovation and dreams of a group of Reclamation pioneers.

The Bureau of Reclamation began investigating alternative energy sources, including wind power, in the fall of 1976. A "solar team" was established to study ways to produce energy by using renewable resources and integrating them with Reclamation's hydroelectric systems.

After listening to a presentation about wind energy given by solar-team member Stan Hightower of the Engineering and Research Center in Denver, Ab Watts of Reclamation's Lower Missouri Region in Denver teamed up with him to develop a plan\* to use wind energy as a power source. This plan formed the basis of what was to become the Medicine Bow wind energy project.

Today, Stan Hightower is the Coordinator of Advanced Energy Applications in the Division of

Research at the Engineering and Research Center; Ab Watts, as the Lower Missouri Regional Supervisor of Power, is responsible for the Medicine Bow wind energy project.

"I was impressed with the curve concerning how much power could be generated by large-scale wind generators," Watts said. "From the start, I saw the potential of tying wind generation with our existing hydroelectric system."

Watts developed a plan for marketing the electricity produced by the wind, and along with Hightower made a presentation to staffs from both houses of Congress. In addition, the Mid-West Electric Consumers Association pushed for funds to study wind energy production.

In October 1977, Congress provided \$200,000 for a special study of the potential to tie large-scale wind energy production in with Reclamation's existing hydroelectric system.

Some \$8 million was appropriated in 1979 to construct a test wind turbine or System Verification Unit (SVU). Negotiations were held with several companies for construction of the machine, and in February 1980, a contract was awarded to Hamilton Standard.

\*"A Proposed Conceptual Plan For Integration of Wind Turbine Generators With a Hydroelectric System," 1977.



During the spring of 1981, Reclamation signed an agreement with the Department of Energy (DOE) and the National Aeronautics and Space Administration (NASA) to build the Boeing unit at the same site.

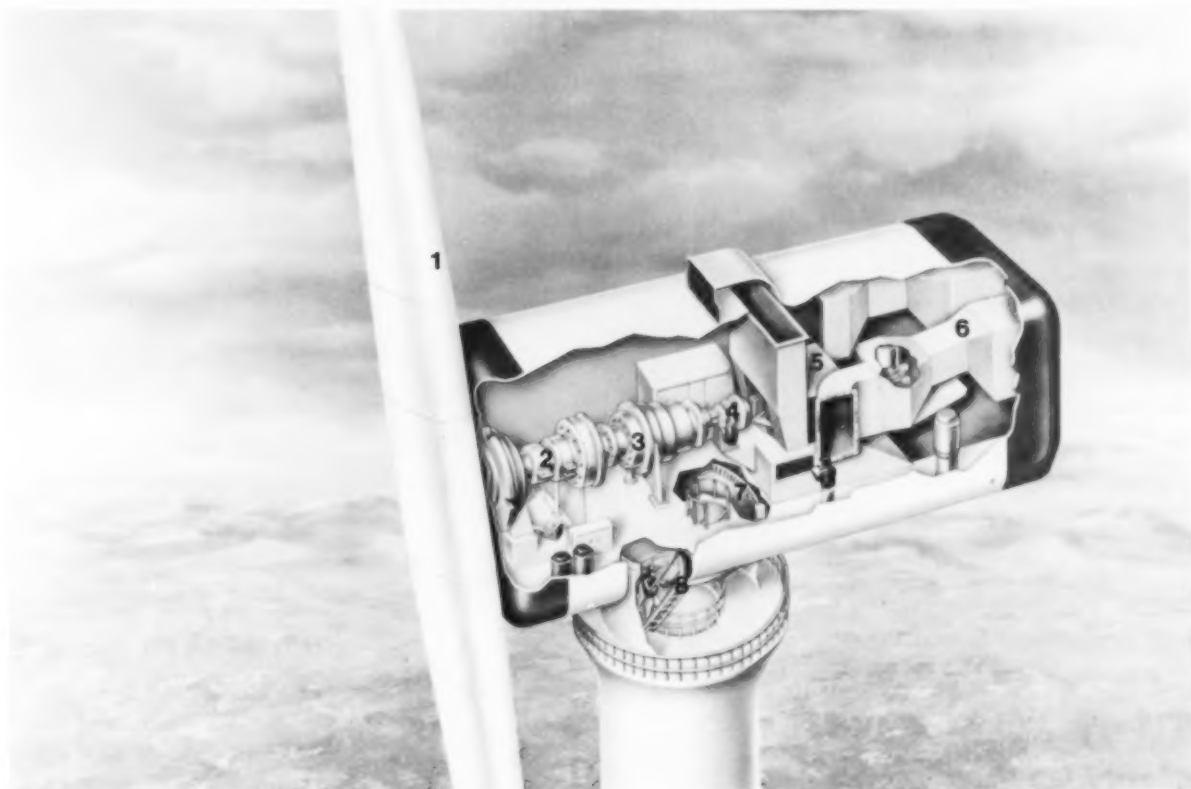
"Completion and start-up of the two Medicine Bow machines are significant from at least three different standpoints," Watts said. "First, it marks the installation and operation of the largest wind tur-

Finally, Watts said that the Medicine Bow wind units provide the opportunity to test the wind-hydro integration plan.

"The 6.5 megawatts produced at Medicine Bow is being fed into the Pick-Sloan Missouri Basin power system," Watts said. "When the wind is blowing at Medicine Bow, electricity comes from the wind turbines. When the wind isn't blowing, power comes from existing Reclamation hydroelectric powerplants."

The report also indicates that such a farm could be successfully tied into the federal power grid system — in this case the Colorado River Storage Project — and that the project would have no adverse effect on the environment.

Commissioner of Reclamation Robert N. Broadbent agrees that such a project is definitely possible with private sector investment or with the right level of non-



bine generator in the world — the Hamilton Standard unit. Early indications show the machine will operate as designed. Secondly, I don't know of any other site in the world where two different machines are being directly compared at the same location. The information provided by the two machines will be invaluable to future wind field planning and construction."

As a result of the studies, a Reclamation project feasibility report indicates that a wind farm producing as much as 100 megawatts could be constructed in the Medicine Bow area. The number of units installed would depend on how much power each unit could produce.

Cutaway of wind turbine housing: 1. rotor; 2. low speed shaft; 3. gear box; 4. high speed shaft; 5. generator; 6. ventilating system; 7. yaw gear and bearing; 8. stairs from elevator to work area in wind turbine housing.

View of the Hamilton Standard wind turbine (foreground) and the Boeing wind turbine at Medicine Bow.



federal cost sharing. Negotiations are underway between the Bureau of Reclamation and the State of Wyoming, several private wind energy companies and other organizations concerning a project at Medicine Bow.

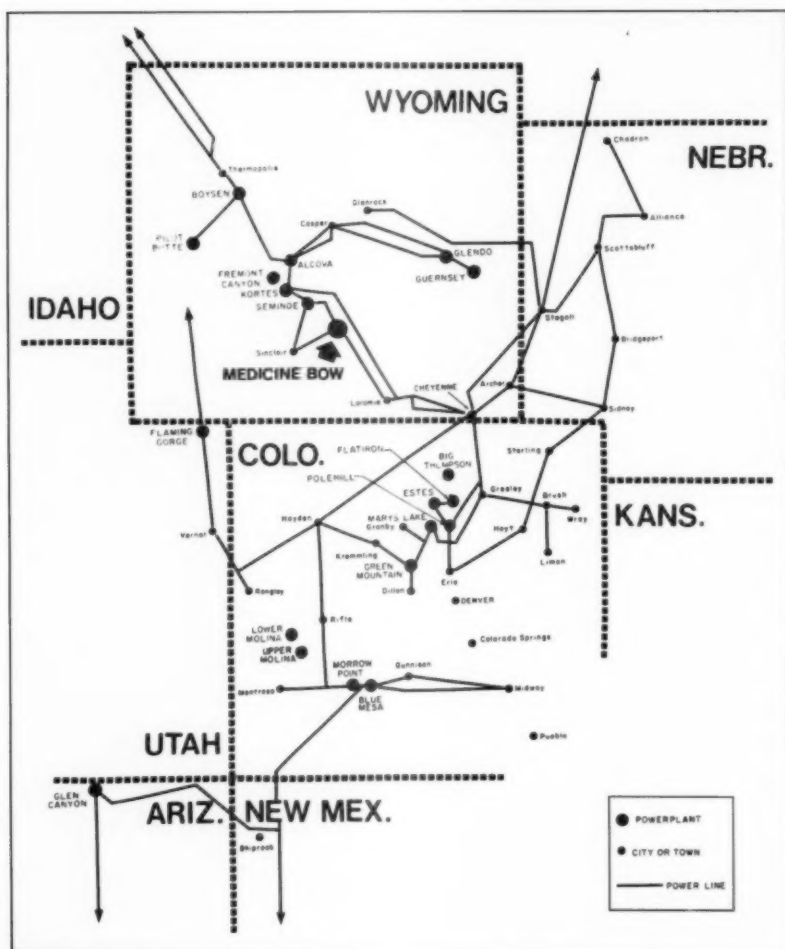
The future of large-scale wind energy production looks promising. In a recent interview with a reporter for the *New York Times*, Watts enthusiastically discussed wind energy.

"Renewable energy resources will be the way to go in the future. The cost of coal extraction and transportation will continue to increase in the future. Petroleum-based energy production is too expensive," Watts said.

"Nuclear has problems with safety and the best hydroelectric sites are already developed. That leaves solar — and wind technology is proven and ready for implementation."

Watts said turbines like the Hamilton Standard and Boeing units could be installed in as little as one year, compared to 15 years to plan and build a coal-fired powerplant.

More large-scale wind energy projects are planned or underway in California than any other state. Two major utilities — Pacific Gas and Electric and Southern California Edison — are committed to installing wind farms producing about 20 megawatts each year by 1987. There are two major reasons for this rapid development. First, there are a large number of good wind sites in the coastal region. Second, California's power system is so large that the utilities have the flexibility it takes to absorb power from new intermittent sources, like wind generators. More importantly, since much of California's electricity is generated at oil-fired power-



Possible wind/hydroelectric power system.



Aerial view of both wind turbines: the Hamilton Standard (foreground) and the Boeing.

plants, the energy brings a premium price — as much as 8 cents per kilowatt-hour — because the value of wind-generated energy is based on present utility costs, not the lower costs of operating wind turbines. In the Rocky Mountain area, where coal and hydro facilities are plentiful, energy is priced at a less costly 2.3 cents per kilowatt-hour.

Thus, the economics of wind power compares very favorably with other sources of power generation. And the cost of wind turbines is expected to drop significantly as companies gear up for mass production.

Limited federal support of large-scale wind energy is continuing. The goal of the program is to find the size unit that will produce power most efficiently and economically. A behemoth even larger than the Hamilton Standard machine is on the drawing boards. Dubbed the MOD-5, the machine would have 400-foot-long blades and generate up to 7 megawatts of power. DOE and NASA are working with Boeing and General Electric and several utilities in developing cost-sharing arrangements to build and test the unit.

The brave pioneer men and women who came West during the 1800's saw the windmill as a device to free them from pumping water by hand. Today, it is looking more and more like the wind turbine may be a device that will provide an important share of the Nation's future energy.

(For technical background see *Reclamation Era*, Vol. 64 No. 3, "Wind and Water: Partners in Power.")

(Continued from page 11)



A country band provided entertainment.

Quips about the wind were definitely in order. "I've seen many folks fall flat on their faces when the wind stops — they're so used to leaning into it," a local resident said.

And towering above this unlikely spectacle were what everyone had come to see — two of the largest wind turbine generators in the world.

Yet, despite all the festivity, an unsettling calm began to hang over the group. It was nearly 10 a.m., and there was no wind.

"I've spent much of my life praying the wind would stop, but this is the first time I've prayed it would blow," one of the local ceremony organizers said.

Not to worry. A brochure on wind power said that wind blows the most at Medicine Bow between 10 a.m. and 10 p.m. And at the stroke of 10 a.m. (as if on cue) a warm 20-mile-per-hour wind began blowing from the southwest, just right for a wind turbine dedication ceremony.



"Pony Express" riders held a race before ceremonies began at Medicine Bow.



Some of those attending the dedication were treated to an inside look at the Hamilton Standard.

By 11 a.m., the crowd had grown to about a thousand people, and there was a different worry. The wind was tearing the bunting and rattling the microphones. A few reinforcements and adjustments solved the problems.

And the ceremonies continued. Mayor Gerald Cook of Medicine Bow, who served as master of ceremonies for the dedication, set the pace with a string of one-liners.

The keynote address was given by Commissioner of Reclamation Robert N. Broadbent. He said the Reagan Administration is greatly encouraged that state and local governments, as well as other non-federal interests, are becoming more involved in planning and financing future water and power projects. "With the right level of non-federal commitment, a 100-megawatt wind farm here at Medicine Bow is a real possibility for the future."

Commissioner Broadbent read a letter from Secretary of the Interior James G. Watt. The letter was hand delivered to the speakers' stand by a winning team member from the "Pony Express" race completed prior to the ceremony.

In part, the letter said, "The brave men and women who came West during the 1800's exhibited self-reliance and innovation to survive the rigors of the environment and to conserve their often limited resources. Today, the people of Medicine Bow find themselves at another frontier — an energy frontier. The dedication of these two giant wind turbine generators marks the beginning of a new era in this Nation's drive for energy self-sufficiency."

Commissioner Broadbent, Senator Malcolm Wallop, Governor Ed Herschler, Hamilton Standard President Richard Gamble, and Boeing President Fred Maxwell then pulled the levers and the two wind turbines began to turn — to the "oohs" and "ahs" of the crowd.



A crowd of about a thousand witnessed the dedication ceremony.



Commissioner Broadbent (right) shared the honor of pulling the levers, starting the giant wind turbines: (left to right) Senator Wallop; Fred Maxwell, President of Boeing; Governor Herschler; Mayor Gerald Cook.





The past and the present meet.

Arrangements were then made for the VIP's to go up into the wind turbine housing to actually watch the great machines at work. There is a small elevator in the vertical shaft supporting the wind turbine housing that will hold four people. Only the officials from the speakers' stand were able to take the elevator ride to view the inner workings of the wind turbines.

Most of the crowd did take the specially arranged buses and vans and ride out to view the Boeing wind turbine in action. The crowd was at first apprehensive because the tips of the turning 300-foot-long blade gave the impression of coming much closer to the ground than they actually did.

Finally, everyone started heading home, leaving a plume of white dust in their wake.

No one at the ceremonies was old enough to remember when author Owen Wister came to Medicine Bow to write "The Virginian," or when Thomas Edison traveled to the area to view an eclipse of the sun. But most who attended the wind turbine dedication ceremonies left feeling they had witnessed a significant event — the ushering-in of an age where massive amounts of electricity will be produced by huge machines that leave no pollution and will never run out of fuel, as long as the wind blows.



Commissioner Broadbent (right) points out a feature of the Hamilton Standard wind turbine to Senator Wallop (left) and Governor Herschler (middle).



The Boeing wind turbine has the longer blade; the tip appears to come closer to the ground than it actually does.

# A Quantum Leap Forward: The Reclamation Reform Act of 1982

by Mitchell Snow

When some future historian spins the saga detailing the settlement of the western United States, few events will match the signing of the Reclamation Act of 1902 in importance. While earlier congressional actions allowed for the opening of the West to homesteaders, the Reclamation Act provided western settlers with some-

thing far more vital than mere land — it provided water for that land and survival. Without water, the Western States would have remained essentially uninhabited.

Eighty years later, the West has become one of the leading producers of agricultural products in

the world, and the growth promoted by the Reclamation Act of 1902 has turned the "Great American Desert" into a homeland for millions of people. Reclamation literally changed the face of the Nation.



Riverside Community Road with Valley Mound Butte in background, Wilder Irrigation District, Boise Project, Idaho, 1914.



Riverside Community Road in 1964 after irrigation development.



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Photography by Gene Hertzog, Regional Photographer, Lower Colorado Region, Boulder City, Nevada; Tom Fridmann, Regional Photographer, Upper Colorado Region, Salt Lake City, Utah; H. L. Personius, former Regional Photographer, Southwest Region,

Amarillo, Texas; Stan Rasmussen, former Regional Photographer, Upper Colorado Region, Salt Lake City; J. D. Roderick, former regional photographer, Pacific Northwest Region, Boise, Idaho. Photographers of historical photos are unknown.



Secretary Watt watches as President Reagan signs the Reclamation Reform Act of 1982 into law. (Photo by Mary Anne Fackelman, The White House).



Aerial view shows the contrast between irrigated citrus groves and desert near Yuma, Arizona.

Today, with the passage of the Reclamation Reform Act of 1982, signed into law by President Ronald Reagan on October 12, 1982, a new chapter in the Reclamation story in the West was opened. *"While preserving the basic objectives of the original program, this legislation provides a new direction for the federal role in Reclamation — one that will, I believe, prove to be a significant step forward on our road to economic recovery in the 1980's,"* the President said.

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*All provisions of the new law will apply to future Small Reclamation Projects.*

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As the success of the Reclamation program became increasingly apparent and the problems the Reclamation Act of 1902 was designed to resolve were solved, a new generation of problems was created. Over the years, the Bureau of Reclamation struggled to implement the increasingly outdated law while trying to keep pace with western growth. Perhaps the most troublesome provision of the original legislation was the 160-acre ownership limitation imposed on Reclamation farmers. This, more than any other issue, became the focus of the discontent that eventually spurred congressional action.

The new Reclamation Reform Act solved the 160-acre limit dilemma with expanded ownership limits on the amount of land for which an individual can receive low-cost Reclamation project water. Under the 1902 legislation, the acreage limitations were handled by the individual water-user and conservancy districts. The new ownership limits are applied uniformly throughout the West under the just passed 1982 law. Both the expanded ownership limits and their application are significant changes.

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*Both the expanded ownership limits and their application westwide are significant changes.*

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Two different ownership limitations now apply to farmers on Reclamation lands. Instead of the former limit of 160 acres, which had been increased by administrative action in 1916 to 320 acres for married couples, the new law expands the limitation to 960 acres for "qualified" recipients. The Act defines "qualified" recipients as any person including spouse and dependents, and legal entities with 25 or fewer beneficiaries. Tax-exempt religious and charitable groups will also be treated as individuals, regardless of their affiliation with any of their respective governing bodies.



Phoenix, from the corner of First Avenue and Washington Street, looking northeast, 1907.



Phoenix, same view, 1963. The city has grown to one-half million in population. Phoenix is in the center of Reclamation's Salt River Project.



Phoenix, same view, 1975. The city boasts close to three-quarters of a million people.



An ownership limitation of 640 acres now applies to what the law calls "limited" recipients, legal entities benefiting more than 25 people.

Farmers who own lands in excess of the limits set by the new legislation will still be allowed to enter into recordable contracts which require the sale of those lands to an eligible purchaser within a specified period. Water deliveries are permitted for excess lands which are under recordable contract.

Under procedures established by the earlier law, the period which landowners had to dispose of their excess lands was 10 years. The new law sets a maximum at five years. Owners of non-Indian lands receiving agricultural water from the yet-to-be-completed Central Arizona Project did receive an exemption, however, which will allow them 10 years from the date water is available to their lands for the disposal of excess lands.

Landowners who entered into recordable contracts prior to the enactment of the new law will be able to amend their contracts to bring them into line with the new acreage limitations. Those recordable contracts which were placed under a moratorium as the end result of lawsuits related to the old 1902 Act will also be affected.

When the moratorium expires on existing recordable contracts, low-cost subsidizing water will be available for the following 18 months. After that 18-month period, full cost will be charged for water used in the irrigation of excess lands for the time remaining on the contract when the moratorium began.

Full-cost payment for water deliveries is directly related to acreage and new operations limitations, which clarifies the leasing of lands above the ownership limits.

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*The 1982 Act does not alter any existing equivalency formulas authorized by Congress.*

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Leasing of farmlands was never addressed under the former law, and many extensive agricultural operations were run on leased land. To resolve the situation, a complex set of provisions was written into the 1982 Reclamation Reform Act.

The leasing of lands in excess of the ownership limitations is permitted under the new law if full cost is paid for the water. Full cost for water includes the unpaid project construction cost allocated to irrigation on an annual basis, with interest.

Four basic leasing situations were addressed by the 1982 Act, and two different interest rate formulas were specified. For "qualified"

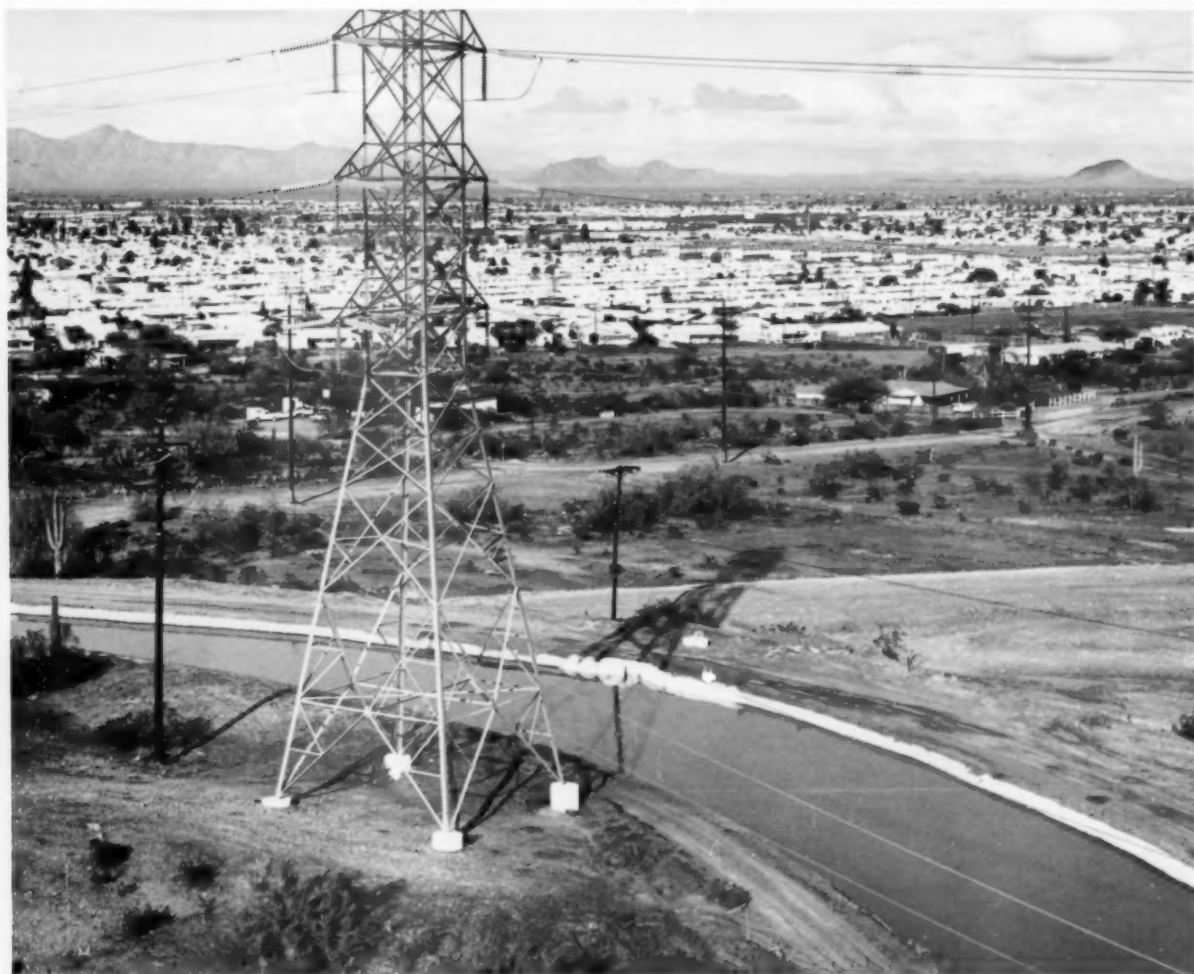
recipients on existing projects, water for more than 960 acres requires full-cost payment based on the weighted average yield of U.S. securities sold during the year in which project expenditures were made, but not less than 7.5 percent. The same interest formula also applies to water for more than 320 acres delivered to "limited" recipients receiving water on or before October 1, 1981.

"Qualified" recipients on new projects will be required to pay full cost for water delivered to acreage in excess of 960 acres, based on the arithmetic average of interest rates on 15-year public obligations and the weighted average yield on all interest-bearing issues sold by the U.S. Treasury during the fiscal year preceding the fiscal year in which project expenditures are made. Today, that figure stands at near 12 percent.

The same interest formula applies to "limited" recipients which first received water after October 1, 1981. However, full cost payment will be required for water delivered to all lands in those operations.

The 1982 Reclamation Reform Act also spells out several other requirements for leasing that have not been employed by the Bureau in the past. All leases for lands served by Reclamation water

Salt River Project's Cross Cut Canal in southwestern  
Scottsdale, Arizona, 1947.



Cross Cut Canal, same view of Scottsdale, 1968.

must now be in writing. Leases will be limited to 10 years, with the exception of leases for perennial crops, which can run for a maximum of 25 years.

Another area closely related to the issue of acreage limitation is the application of Class 1 Equivalency. Essentially, equivalency formulas provide for expanded ownership limits by equating all lands in a district to the most productive lands in that district. The new Act does not alter any existing equivalency formulas already authorized by Congress. However, it does give the Bureau of Reclamation flexibility to implement any new system of classification which it might develop.

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*The 1982 Reform Act has eliminated all residency requirements.*

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The application of Class 1 Equivalency, as well as the provisions for expanded acreage limitation and many other sections of the Act, does not automatically apply to all Reclamation lands. Provisions of the new law apply only to:

1. contracts entered into after the enactment of the Act;
2. existing contracts which are amended to grant supplemental or additional benefits to a district;
3. contracts which are specifically amended upon the request of the water district to bring them into conformance with the new law.

Districts on existing projects may elect to retain the provisions of the old law, although individual water users may elect to come under the provisions of the new Act even if their district does not choose to do so.



Farm Unit 57 on the Columbia Basin Project in Washington State, 1960.



In less than ten years, Farm 57 after using irrigation water from the Columbia Basin Project.

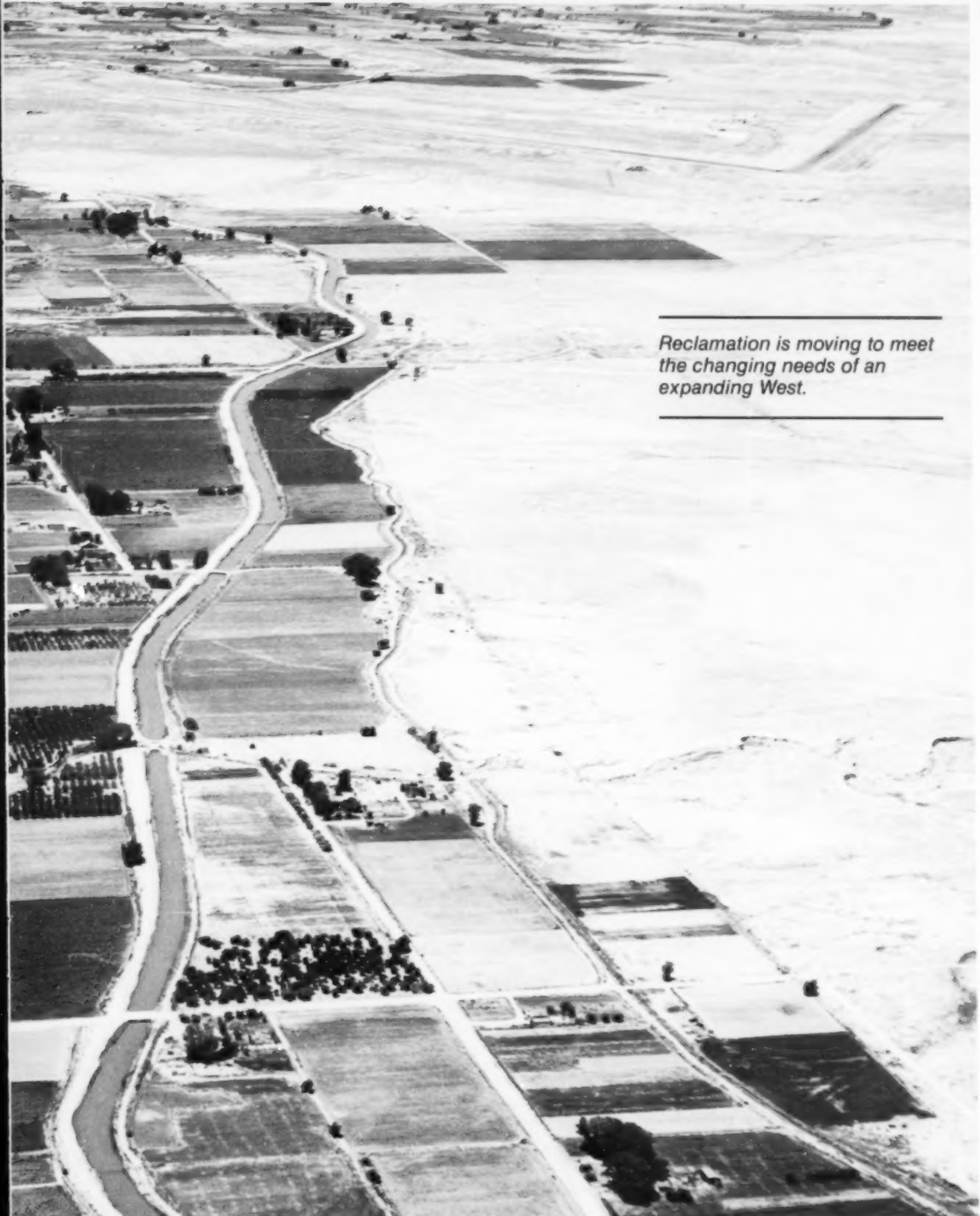
Those districts which decide to operate under the old law will be limited to the 160-acre ownership ceiling. Full cost, based on the arithmetic average of interest rates on 15-year U.S. Treasury bonds sold during fiscal year 1983, will be applied to water delivered to all leased lands that exceed the 160-acre ownership limit for districts which fail to amend their contracts within 4½ years.

Recipients of Reclamation project water in districts which choose to enter into new or amended contracts will be required to certify that they are in compliance with the new legislation. Each landowner and lessee within a water district will have to furnish the district with a certificate stating the amount of land owned and leased in their operations, the term of the



Contrast between irrigated farming on Reclamation's Grand Valley Project in Colorado and the surrounding desert.





*Reclamation is moving to meet  
the changing needs of an  
expanding West.*



lease, and a statement that the rent on the lease reflects the reasonable values of the irrigation water.

Another issue closely related to the acreage limitation debate has been the residency requirement. Under the 1902 Act, landowners had to live on or near the land they farmed. However, when the provision was left out of the 1926 Omnibus Adjustment Act, the status of the requirement became unclear. The 1982 Reform Act had ended the confusion over the issue by eliminating all residency requirements.

Water delivered from U.S. Army Corps of Engineers' projects to farmlands in Reclamation states also entered the controversy over acreage limitation. The issue was addressed and resolved by the 1982 Reclamation Reform Act. Now, unless Congress has specifically designated that Reclamation law applies to a Corps project or the project contains works provided by the Secretary of the Interior, those projects are exempt from acreage limitations.

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*All water districts which have entered into a repayment or water service contract will be required to develop water conservation plans.*

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Only districts which have completed their repayment obligation will be exempt from acreage limitation, although they will still be liable for operation and maintenance charges on their projects. Existing or future rehabilitation and betterment loans will not subject these water districts to acreage limitation provisions once their construction cost repayments have been completed. Existing contracts allowing accelerated repayment of project construction costs will continue to be valid, but lump sum or accelerated repayment was not authorized under any other conditions.



Commissioner Robert N. Broadbent visits Grand Coulee Dam in Washington State, on an inspection tour of the Columbia Basin Project, one of Reclamation's largest multipurpose projects.

All new amended contracts will carry sections which require operation and maintenance charges to be calculated and applied on a yearly basis. In the past, certain districts were allowed an exemption from these charges. Districts which operate and maintain their project facilities without federal funds will be exempt from this provision.

All water districts which have entered into a repayment or water service contract with the Bureau of Reclamation will be required to develop water conservation plans. The new law directs that the plans contain definite goals, specific water conservation measures, and a timetable for meeting their conservation objectives. The Secretary of the Interior is also authorized to enter into memorandums of agreements providing for the coordination of federal water conservation programs with the participation of non-federal interests.

The new Act also requires the Secretary of Agriculture, with the cooperation of the Secretary of the Interior, to send a report to Congress on the production of surplus crops on acreage served by Reclamation irrigation water within a year. The report is to include recommendations on the coordination of Reclamation and agricultural policy regarding surplus crops. The law also provides that on existing Reclamation projects, restrictions on the delivery of water to surplus crops extend no longer than 10 years after the date of initial authorization of the project.

All of the provisions of the new Reclamation law will apply to future Small Reclamation Projects. The 160-acre limit for all Small Reclamation Projects already in existence will remain valid for the time being.

President Reagan said that the bill is a major step forward in the Administration's efforts to work



more closely with the States. He said, *"Enactment of this landmark legislation makes a federal-state partnership in water resources development an overdue reality and stands as a symbol of our commitment to such partnership."*

The Bureau of Reclamation is carrying out the Administration's plan to implement the new law and meet the challenge of transforming the practices that have grown up around the Reclamation Act of 1902. The Bureau of Reclamation's moving to meet the changing needs of an expanding West and to extend Reclamation's traditions of outstanding accomplishment in water resources development into the 21st century.

Altus, Oklahoma. Two reservoirs in foreground hold water transferred from Reclamation's Altus Reservoir via the W. C. Austin Project's main canal. This water is used by Altus for municipal purposes and for fishing by local residents.



The Museum's South Portico.

# "Water And The West"...

Reclamation's New Exhibit  
at the Museum of Science  
and Industry in Chicago

By Tom Hughes

It was back in the mid '30's that the association began. It coincided with the completion of Hoover Dam, recognized as one of the engineering marvels of our time. The association was a "natural" between the progressive, standard-setting federal dam-building agency and the aggressive, forward-looking Museum of Science and Industry in Chicago. A working model of Hoover Dam was installed in the Museum to help tell the world about this engineering feat. After all, it was the greatest dam of its time, giving man his first real control of the mighty Colorado River.



Tom Hughes, Public Information Specialist, serves in the Bureau of Reclamation's Office of Public Affairs in Washington, D.C.

Photography by Robert A. Pauline, Reclamation's Photographic Coordinator in the Public Affairs Center, Denver, Colorado.

For many years, the model was a favorite attraction for Museum visitors, and, for awhile, it was likely that more people saw Hoover Dam at the Museum than at its remote site on the Colorado River near Las Vegas.

By the mid 1970's, the Reclamation staff had changed several times over, and the Bureau's association with the Museum had been largely forgotten. So it was a bit of a surprise the day the Museum contacted the Bureau's Washington office requesting assistance to upgrade the Reclamation exhibit. By this time, the working model of Hoover was so outdated that the exhibit had been closed.

Once the Bureau renewed its association with the Museum, which averages nearly four million visitors each year, a concerted effort began to replace the Hoover exhibit with a totally new, comprehensive presentation of water resources development and management in the West.

After years of concept evaluations, design changes and approvals, the new permanent Reclamation exhibit at the Museum of Science and Industry became a reality. The final impetus was given by Commissioner Robert N. Broadbent, Assistant Commissioner for Administration William Klostermeyer, and Director of Public Affairs Cheryl Riedmiller.

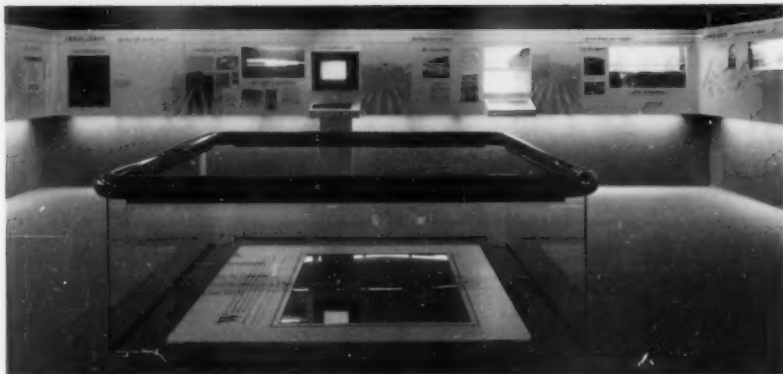
On July 18, 1982, the new exhibit was opened. A brief ceremony was held within the exhibit room to officially mark the occasion. Dr. Victor Danilov, President and Director of the Museum, and Commissioner Broadbent hosted the event. Upon completion of the ceremony, a group of visitors enthusiastically experienced the Museum's newest Reclamation exhibit, "Water and The West."

A broad range of information regarding water, power production, and related subjects throughout the 17 Western States is presented through "hands-on" exhibits.

The first exhibit demonstrates the promising concept of pumped storage. Water is pumped by the visitor to a transparent overhead tank. Upon release, the falling water turns a water wheel, then collects in a lower tank, ready to be pumped again to the overhead tank. The concept is applied to reservoirs constructed at different elevations to produce power in a similar fashion to meet a community's power needs at periods of peak demand.

At the new exhibit, the visitor becomes the master engineer at the computerized energy control board. A surge of water through penstocks activates hydroelectric generators, an artificial "sun" energizes solar cells, and "wind"

An overall view of the Reclamation exhibit, "Water and the West." On the far side of the railing which encloses the floor-mounted projection screen for the film, "A Journey Down the Colorado," are the pumped storage demonstration unit and the computer control unit for the energy display.



Ready for the official ribbon-cutting to open the exhibit are: (left to right) Jed Christensen, Staff Assistant to the Commissioner; Robert N. Broadbent, Commissioner of Reclamation; William Klostermeyer, Assistant Commissioner for Administration; Dr. Victor Danilov, President and Director of the Museum of Science and Industry; and Cheryl Riedmiller, Reclamation's Director of Public Affairs.



rotates a rotor on a modern-day windmill. Each source of energy is used separately to produce electricity or is operated in combination with other sources to show the potential for integrating these non-polluting methods of generating electricity into an overall power system.

A computerized quiz testing the visitor's knowledge of water needs, use and management is featured in another exhibit. Here are some sample questions:

-The amount of water all Americans use daily is given in billions-of-gallons per day, or BGD. How many BGD's do you think we use?

- A. 50 BGD
- B. 100 BGD
- C. 225 BGD

The correct answer is "C" and the amount is increasing each year.

-What percent of the Earth's water is fresh water?

- A. 70%
- B. 1%
- C. 10%

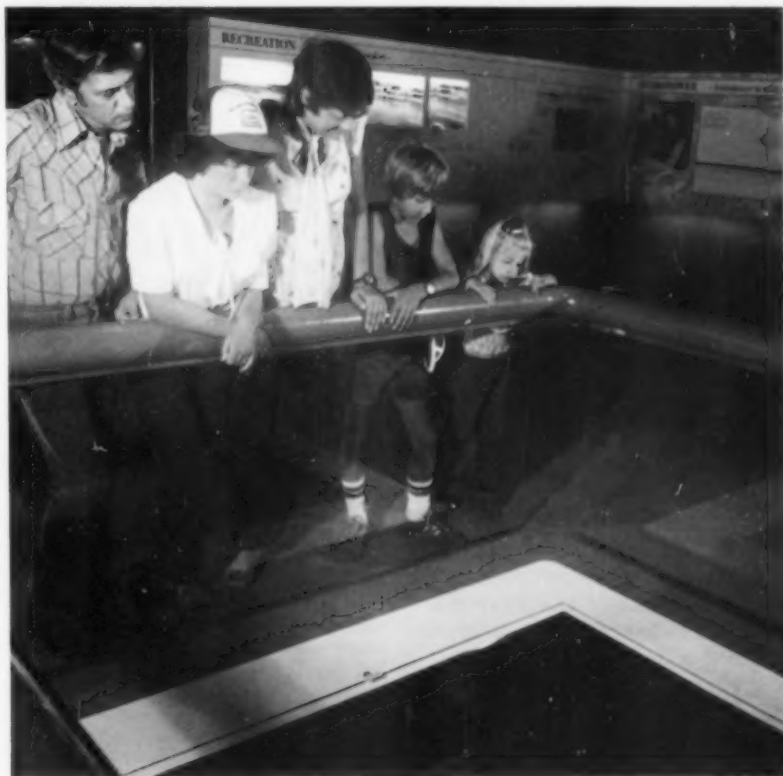
"B" is the correct answer.

-How much of the Colorado River is used as it runs its course from the Rocky Mountains to the Gulf of California?

- A. 25%
- B. 87%
- C. 100%

"C" is the correct answer. In fact the Colorado River is over-committed. After passing through the southwestern States and a small part of Mexico, the Colorado River ends in a trickle before it reaches the Gulf of California.

You are there as the helicopter dips into the canyons of the Colorado River. Visitors peering over the railing at the projection screen built into the floor see the Colorado River and Reclamation facilities the way the camera mounted to the underside of the helicopter sees them. The projector, located beneath the floor, projects onto a mirror which reflects the images to the screen.



The next display highlights water recreation, an important by-product of Reclamation reservoirs. The reservoirs, located in geographical areas ranging from desert sands to pine forests, provide some of the finest water recreation areas in the country.

Another exhibit illustrates the geology of soil and the climatic range experienced in the West. Comparisons are made between

various regions of the Nation and the West. For example, comparisons are made of the amount of rainfall (Chicago receives more than 29 inches annually while Salt Lake City gets approximately 12 inches), the availability of fresh water, and the distances over which it has to be transported. This exhibit presents information new to many visitors unfamiliar with the West.

The fragile ecology is vividly portrayed in a series of photographs. Treasured historical photos, which keep alive the memory of Reclamation's early beginnings and the triumphs over an uncompromising and unforgiving land, are enjoyed by young and old alike.

Although many problems facing the West's early settlers were solved by the Reclamation program, new problems, such as increased salinity, took their place. Advancements in salinity control and waste-water reuse are discussed.

Irrigation, from the kind practiced by early Indians to the methods used today, is a topic of considerable interest. In crop-growing regions of the arid West, the main concern is getting sufficient water in the right place at the right time.

Throughout the West, the visitor learns, dams are built to store water and to provide a dependable supply of good quality water year-round. A vast network of irrigation canals and pipelines is used to bring the elements of land and water together and to make possible the bountiful production of food and fiber that comes from the West.



Just one of the spectacular photographs which are part of the Reclamation exhibit. Such scenes emphasize the differences in climates and conditions between parts of the West and most of the rest of the Nation.



Generate your own electricity using water, solar energy or wind — or a combination. The unit demonstrates the concept of each energy source and how the individual systems can be integrated for maximum efficiency.



The quiz. It's hard to resist taking the computerized multiple-choice test to determine just how much you know about water.

Great strides have been made in cloud seeding, the science of priming a potential rain cloud with silver iodide or dry ice. The exhibit makes the point graphically. The fact that man can exert some influence over nature and extract moisture from the clouds is especially exciting to the science-oriented students who visit the Museum.

Conservation is highlighted in the exhibit. In the West, the amount of water available is limited. The costs of storing and transporting water have risen rapidly. It is conceded that man is often wasteful of this precious resource. The message is two-fold. While the visitors learn of the conservation efforts being made by the Bureau of Reclamation and others, they are reminded that conservation should be practiced by all.

In the center of the exhibit room, a railing encloses a projection screen built into the floor. Visitors get the feeling of looking down from a helicopter as they follow

the Colorado River along its course. The unique film was produced especially for the exhibit. The 6-minute, continuous-showing presentation, "A Journey Down the Colorado," was shot by a camera mounted to the underside of a helicopter, providing an interesting and unusual point of view. Charlton Heston narrates the film.

Why did the Bureau of Reclamation create and install an exhibit just for the Museum of Science and Industry, since the Bureau is involved only in the 17 Western States?

"It continues our long association with this very prestigious museum, and it's an excellent location to show those unfamiliar with the Reclamation program what Reclamation has accomplished and what problems we face today in water resources development and management," Commissioner Broadbent said during the dedication ceremonies. "The Museum draws visitors from every State and from many foreign countries. In telling the story of Reclamation, we show

where tax dollars have gone to benefit not only the West, but the Nation as a whole. Moreover, we show that those benefits far exceed what has been spent on the Reclamation program over the years."

Dr. Danilov's comments paralleled Commissioner Broadbent's: the story of water in the West is an important story which needs to be told. "Water is our most important resource," Danilov said, "and the need for conservation and better utilization of that resource is of the highest priority. The Reclamation exhibit conveys that message. The exhibit fits well with the nearly 2,000 other displays covering some 75 fields of interest that make up the Museum of Science and Industry, and I feel it will be extremely popular."

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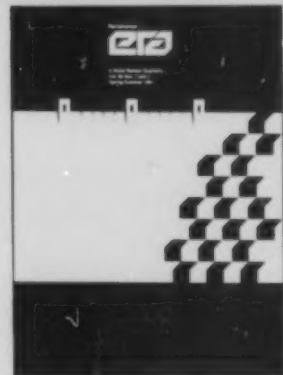
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